Impacts of Water Supply Uncertainty and Storage

on efficient irrigation technology adoption

Factors influencing the adoption of efficient irrigation technologies

As the demand for water continues to increase while at the same time climate change puts pressure on existing hydrological systems, efficient usage of water gains importance. Efficient water usage is especially crucial in the agricultural sector which typically uses up to 70% of water resources. Modern irrigation technologies which improve the efficiency of irrigation may form part of the solution towards sustainable water management and climate change adaptation at a farm level.

In order to encourage farmers to adopt efficient irrigation technologies, it is essential to understand the factors which influence this decision. Bhaduri and Manna use a dynamic analytical framework to explain a farmer's decision on the timing of adoption of efficient irrigation technology. They investigate the impact of water supply uncertainty stemming from climate change and water storage capacity at a farm level on the decision of farmers to invest in efficient irrigation technology under a flexible water price regime.

Impact of water storage capacity

In many regions water storage helps to mitigate the effects of scarce and unreliable water supply. The opportunity to store water raises the value of efficient irrigation technology to farmers and thus may induce them to improve their water-use efficiency. The study by Bhaduri and Manna explores if investment in water storage capacity at farm level could induce farmers to adopt efficient irrigation technology under variable water supply. Results imply that a complementary relationship between storage capacity at a farm level and investments in efficient irrigation exists. This relationship becomes stronger when variance in water supply increases. The opportunity of water storage encourages the adoption of efficient irrigation technology when water supply is unreliable. However, if farmers invest in water storage facilities, they also reduce their monetary resources available for investments in efficient irrigation technology. An analysis of expected technology adoption over time shows that the rate of adoption of efficient irrigation will first be lower than in a scenario without water storage opportunities, due to investments in storage capacity, and increase in later years. When given the opportunity to invest in water storage capacity, farmers will be motivated to use water more efficiently.

A flexible water pricing regime

Water pricing has often been argued to provide incentives for more efficient water usage by establishing a recognized water value. The study investigates whether water pricing alone can guarantee higher adoption of efficient irrigation technologies given the uncertainty in water supply. A flexible water price system is assumed in which the water price depends on the excess demand of water. The theoretical results of the study indicate that the presence of a flexible water price alone cannot guarantee an increase in the adoption rate of efficient irrigation technology under increasing uncertainty in water supply. However, when examining expected adoption rates over time, the authors find that a flexible water price plays a significant role in inducing the adoption of efficient irri-

gation technology. In contrast to fixed water pricing schemes, flexible water pricing may encourage farmers to adopt efficient technology at a faster rate.

Policy implications

The results of the study indicate that flexible water price regimes as opposed to fixed, administratively determined pricing schemes may be more appropriate to promote the adoption of efficient irrigation technology among farmers. Although even flexible water pricing cannot guarantee higher adoption under increasing variance of water supply, it is a valid alternative for increasing the efficiency of water use. If farmers additionally have the opportunity to invest in water storage capacity, the rate of adoption of efficient irrigation technology will be significantly higher. Any approach which encourages investments in storage capacity, however, needs to consider the fact that the majority of farmers especially in poor countries have limited investment abilities.

BASED ON THE PAPER

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IMPRESSUM

Summary by Talin Holtermann

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The Global Water System Project seeks to answer the fundamental and multi-faceted question:

How are humans changing the global water cycle, the associated biogeochemical cycles, and the biological components of the global water system and what are the social feedbacks arising from these changes?

GWSP is a joint project of the four Global Environmental Change Programmes: DIVERSITAS, the international programme of biodiversity science, the International Geosphere-Biosphere Programme (IGBP), the International Human Dimensions Programme on Global Environmental Change (IHDP) and the World Climate Research Programme (WCRP).